

WHAT IS CLAIMED IS:

- 1           1.     A field portable mass spectrometer system comprising:
- 2           a)     an aerosol interface;
- 3           b)     a sample transporter, the sample transporter interfacing with the sample collector
- 4 to receive sample deposits thereon;
- 5           c)     a time of flight (TOF) mass spectrometer, the time of flight mass spectrometer
- 6 having a sealable opening that receives the sample transported via the sample transporter in an
- 7 extraction region of the mass spectrometer; and
- 8           d)     a control unit that processes a time series output by the mass spectrometer for a
- 9 received sample and identifies one or more agents contained in the sample.
- 1           2.     The field portable mass spectrometer system of Claim 1, wherein the aerosol
- 2 interface comprises an inlet having a vacuum therein, the inlet collecting an environmental
- 3 specimen containing one or more analytes.
- 4           3.     The field portable mass spectrometer system of Claim 2, wherein the aerosol
- 5 interface further comprises a nebulizer for injecting metered amounts of MALDI matrix particles
- 6 into the environmental specimen prior to the inlet collecting the environmental specimen.
- 7           4.     The field portable mass spectrometer system of Claim 3, wherein the metered
- 8 amounts of MALDI matrix particles mixed with the one or more analytes contained in the
- 9 environmental specimen form a spatially heterogeneous distribution of analyte and matrix.
- 1           5.     The field portable mass spectrometer system of Claim 2, wherein the metered
- 2 amount of matrix solution injected into the environmental specimen is adjusted in accordance
- 3 with differing amounts of environmental background.
- 4           6.     The field portable mass spectrometer system of Claim 2, wherein the aerosol
- 5 interface further comprises one or more tape particle collector/impactor stations for collecting,
- 6 concentrating and separating said one or more analytes contained in said environmental sample.
- 7           7.     The field portable mass spectrometer system of Claim 1, wherein the sample
- 8 transporter comprises a tape that receives the sample deposits from the sample collector, the tape

3 being received at the sealable opening of the mass spectrometer, thereby allowing a sample  
4 thereon to be received in the extraction region of the mass spectrometer.

1 8. The field portable mass spectrometer system of Claim 7, wherein movement of  
2 the tape when interfacing with the sample collector is independent of movement of the tape when  
3 being received in the mass spectrometer.

1 9. The field portable mass spectrometer system of Claim 7, wherein the sample  
2 transporter further comprises a first controllable motor that receives control signals from the  
3 control unit and enables independent movement of the tape when interfacing with the sample  
4 collector and a second controllable motor that receives control signals from the control unit and  
enables independent movement of the tape when being received in the mass spectrometer.

1 10. The field portable mass spectrometer system of Claim 7, wherein the independent  
2 movement of the tape is provided at least in part by a movable tensioner that interfaces with the  
3 tape, the movable tensioner being interposed between the sample collector and the mass  
4 spectrometer.

1 11. The field portable mass spectrometer system of Claim 7, wherein the tensioner is  
2 a spring-loaded shaft and roller arrangement, the tape being wound around at least a part of the  
3 shaft and roller components.

1 12. The field portable mass spectrometer system of Claim 1, wherein the TOF mass  
2 spectrometer comprises a linear TOF mass spectrometer.

1 13. The field portable mass spectrometer system of Claim 1, wherein the TOF mass  
2 spectrometer comprises a linear and/or reflectron TOF mass spectrometer.

1 14. The field portable mass spectrometer system of Claim 1, wherein the sealable  
2 opening and the extraction region of the TOF mass spectrometer are provided in a housing  
3 attached to or part of the TOF mass spectrometer.

1 15. The field portable mass spectrometer system of Claim 13, wherein the housing  
2 further comprises a roughing vacuum chamber portion that connects between the sealable  
3 opening of the housing to a vacuum valve.

1 16. The field portable mass spectrometer system of Claim 13, wherein the housing  
2 further comprises a removable cover that is engageable with the sealable opening, the removable  
3 cover and the sealable opening forming a vacuum seal when engaged.

1 17. The field portable mass spectrometer system of Claim 14, wherein a roughing  
2 pump interfaces with the roughing vacuum chamber portion and serves to evacuate the roughing  
3 vacuum chamber portion when (a) the vacuum seal is formed between the removable cover and  
4 the sealable opening and (b) the vacuum valve is closed.

1 18. The field portable mass spectrometer system of Claim 14, wherein the vacuum  
2 seal is provided by at least one o-ring in each of the removable cover and the sealable opening,  
3 the o-rings engaging to form a vacuum seal when the removable cover engages the sealable  
4 opening.

1 19. The field portable mass spectrometer system of Claim 15, wherein the cover is a  
2 platen.

1 20. The field portable mass spectrometer system of Claim 14, wherein a surface of the  
2 cover that covers the sealable opening comprises an electrode and defines one end of an  
3 extraction region of the TOF mass spectrometer in the roughing vacuum chamber portion.

1 21. The field portable mass spectrometer system of Claim 16, wherein one or more  
2 additional electrodes surrounding the roughing vacuum chamber portion and lying between the  
3 sealable opening and the vacuum valve defines another end of the extraction region.

1 22. The field portable mass spectrometer system of Claim 19, wherein a vacuum  
2 pump that interfaces with the main mass spectrometer vacuum chamber serves to evacuate the  
3 main mass spectrometer vacuum chamber.

1 23. The field portable mass spectrometer system of Claim 20, wherein the open valve  
2 between the mass spectrometer vacuum chamber and the extraction region forms part of the time  
3 of flight path of the spectrometer.

1 24. The field portable mass spectrometer system of Claim 20, wherein the vacuum  
2 pump that interfaces with the main mass spectrometer vacuum chamber serves to evacuate the

- 3 main mass spectrometer vacuum chamber and the roughing vacuum chamber when the valve is  
4 opened, thereby providing a connected vacuum between the main mass spectrometer vacuum  
5 chamber and the roughing vacuum chamber when the valve is opened.